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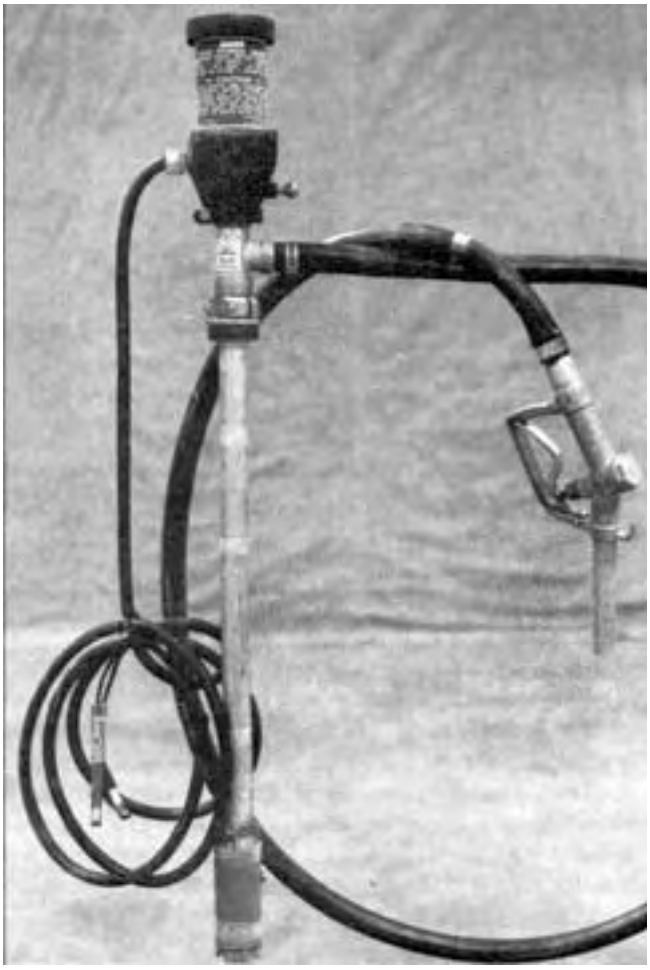
Evaluation Report 65



Mico 5012 Series (Model 02-820-012) Fuel Transfer Pump

A Co-operative Program Between
ALBERTA FARM MACHINERY RESEARCH CENTRE
PAMI
PRAIRIE AGRICULTURAL MACHINERY INSTITUTE

MICO 501 2 SERIES (02-820-01 2) FUEL TRANSFER PUMP

MANUFACTURER:

Minnesota Automotive Inc.
1911 Lee Boulevard
North Mankato, Minnesota 56001
U.S.A.

DISTRIBUTOR:

Oliver Industrial Supply Ltd.
236 - 36th Street North
Lethbridge, Alberta
T1J 4B2

RETAIL PRICE:

$249.61 (February, 1979, f.o.b. Lethbridge)

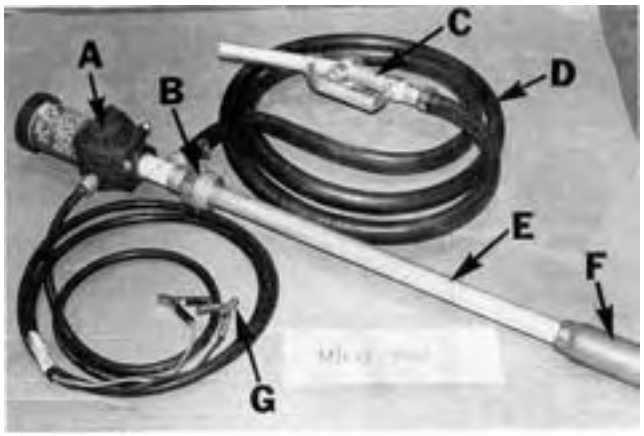


FIGURE 1. Mico 5012 Series Fuel Transfer Pump: (A) Pump Motor. (B) Bung Adaptor. (C) Nozzle. (D) Outlet Hose. (E) Standpipe, (F) Impeller Housing. (G) Battery Cable.

SUMMARY AND CONCLUSIONS

The fiowrate for the Mico 5012 Series fuel transfer pump when pumping diesel fuel with a fully charged 12 volt battery at zero discharge head was 60 L/min (13.2 gal/min). Increasing the discharge head to 2.7 m (9 ft) resulted in a 12% reduction in flowrate. Maximum measured flowrate was the same as the manufacturer's stated capacity of 60 L/min (13.2 gal/min). It took about 4 minutes to fill a 225 L (50 gal) tractor fuel tank located about 1 m (3.3 ft) above the fuel supply tank.

Power consumption at 12 volts was 324 watts with a corresponding current draw of 27 amps. A fully charged 12 volt battery could operate the pump for a few hours without recharging.

The Mico 5012 was very portable and was very easy to install in a fuel supply tank since it was equipped with a rotating bung adaptor. Electrical connections were simple. The motor had a 30 minute continuous duty cycle. As a result, from 1590 to 1800 L (350 to 396 gal) could be continuously pumped before the motor had to be allowed to cool.

The Mico 5012 was equipped with a screen located at the bottom of the impeller housing and could be easily serviced.

The Mico 5012 was safe to operate if normal safety precautions for transferring fuel were observed.

A well illustrated parts list and comprehensive operating instructions were provided.

Two problems occurred during the test. Force was required to insert the standpipe into most fuel supply tanks since the impeller housing was slightly larger than the 50 mm (nominal 2 inch NPT) fuel supply tank opening. The outlet hose was soft and kinked at the ends.

RECOMMENDATIONS

It is recommended that the manufacturer consider:

1. Supplying, as an option, a fuel supply nozzle that can be locked open and which is equipped with an automatic shut-off.
2. Supplying a receptacle for storing the pump nozzle when not in use.
3. Providing a means of locking the pump nozzle to the pump body to prevent theft.
4. Modifications to prevent the hose from kinking.
5. Modifications to the impeller housing to permit easier installation in fuel supply tanks.

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THE MANUFACTURER STATES THAT

With regard to recommendation number:

1. Automatic nozzles are readily available from petroleum companies. These nozzles will work on this pump if the user so desires.
2. & 3. Provisions are being made for a nozzle holder on this model. This will be available on units manufactured later this year. This nozzle holder will provide some means of locking the nozzle to the pump.
4. This pump is sold with the hose and nozzle as an option. The photographs submitted with the test report clearly show that our hose and nozzle were not used in this test.
5. The model tested was manufactured over two years ago. Since that time, the material in the lower pump housing has been changed and the diameter is slightly smaller.

GENERAL DESCRIPTION

The Mico 5012 Series (Model 02-820-012) is a self-priming, impeller type pump driven by a 12 volt DC electric motor, adaptable to either negative or positive ground vehicle electrical systems. The electric motor is located on top of the standpipe and the impeller at the base of the standpipe (FIGURE 1). It is designed for pumping gasoline, kerosene, or diesel fuel from above ground tanks or drums equipped with 50 mm (nominal 2 in NPT) openings. The pump is equipped with a 762 mm (30 in) standpipe, a 3.9 m (12.8 ft) outlet hose with standard fuel pump nozzle and a 3.7 m (12 ft) battery cable with alligator clamps.

Detailed specifications are given in APPENDIX I.

SCOPE OF TEST

The Mico 5012 was evaluated for ease of operation, power consumption and safety. Pump performance characteristics at various voltages and discharge heads were determined with diesel fuel.

RESULTS AND DISCUSSION

PUMP PERFORMANCE

Flowrate: Pump performance characteristics in diesel fuel over a typical range of discharge heads are given in FIGURE 2 Discharge head is the height the outlet nozzle is held above the pump motor. The fiowrates in FIGURE 2 are for a pump powered with a fully charged 12 volt battery and with a full fuel storage tank.

The maximum flowrate of 60 L/min (13.2 gal/min) was obtained with the fuel supply tank full and at zero discharge head. Increasing the discharge head reduced the fiowrate slightly. For example, increasing the discharge head to 2.7 m (9 ft) resulted in the flowrate decreasing to 53 L/min (11.7 gal/min). This increase in discharge head is more severe than would be encountered in transferring fuel to most farm machinery and represents a 12% decrease in flowrate.

The amount of fuel in the supply tank had very little effect on the flowrate.

In filling a typical farm tractor, with filler opening about 1 m (3.3 ft) above the top of the fuel supply tank, and with the fuel supply tank one-half full, flowrate would be about 57 L/min (12.5 gal/min).

The maximum flowrate of 60 L/min (13.2 gal/min) was the same as the manufacturer's stated flowrate.

Duty Cycle: Protection was provided to prevent the pump motor from burning out due to continuous operation. The pump

was equipped with a circuit breaker located near the bottom of the pump motor. Tests showed that the pump could only be operated for 30 minutes continuously, as specified by the manufacturer, before the breaker opened, causing the pump to stop. The temperature in the vicinity of the circuit breaker, after 30 minutes continuous operation, was about 75° C. Handling the pump after prolonged use is not recommended due to the pump casing being very hot.

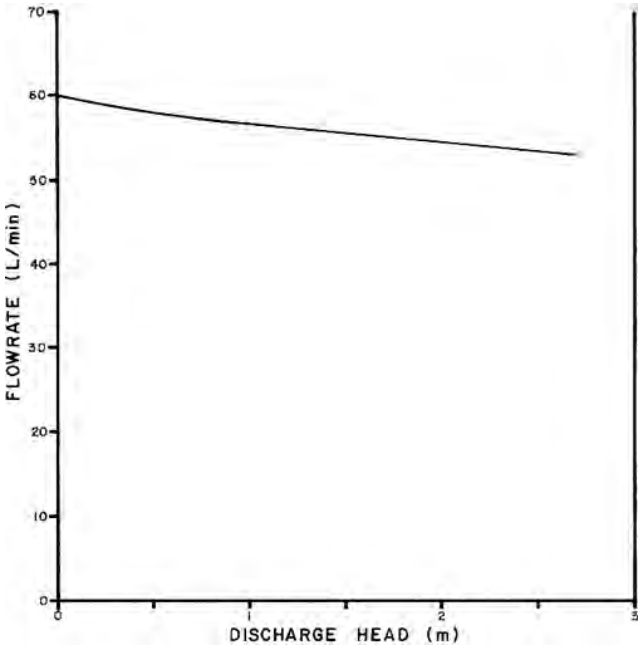

FIGURE 2. Pump Performance Characteristics with a Full Tank of Diesel Fuel when Powered with Fully Charged 12 Volt Battery.

POWER CONSUMPTION

FIGURE 3 shows the effect of battery voltage on pumping rates and also indicates the corresponding current draw. A fully charged 12 volt battery will deliver 12 volts. The current draw at 12 volts was 27 amps. Therefore, the maximum flowrate of 60 L/min (13.2 gal/min) can be expected for a couple of hours with a good battery, without recharging. There should, therefore, be no need to consider charging a truck battery by running the truck motor while refueling.

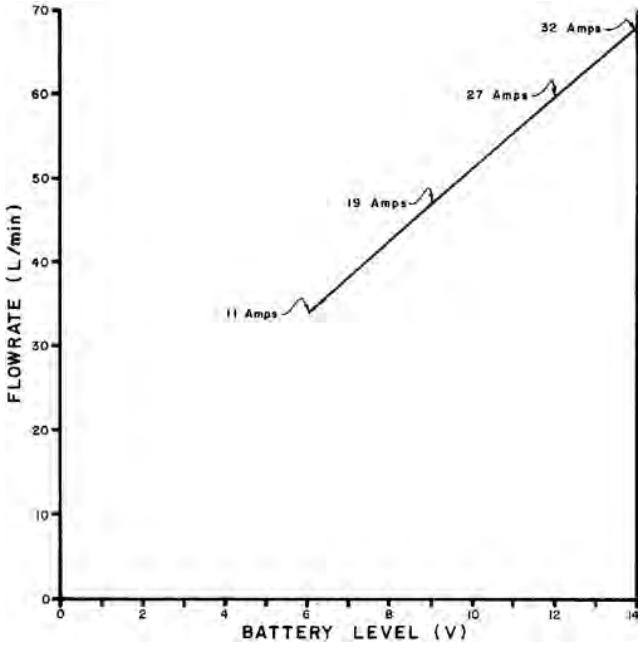

FIGURE 3. Flowrates with Diesel Fuel at Zero Discharge Head for Various Battery Voltages.

A running engine could result in the exhaust igniting fuel vapours.

A typical battery under charge will deliver more than 12 volts. At 14 volts the flowrate increased to 68 L/min (15 gal/min) with a corresponding current draw of 32 amps. This means that the flowrate increased only 13% but the current draw increased 19% while charging the battery during pumping. As a result, power consumption was increased from 324 watts at 12 volts to 448 watts at 14 volts. Since most of the additional power has to be dissipated as heat in the pump motor, operating the pump with the battery under charge would serve to decrease the pump duty cycle, due to motor overheating. This further substantiates that the pump not be operated while vehicle engines are running.

EASE OF OPERATION

Fuel Tank Connection: The Mico 5012 was portable and was equipped with a 5.0 mm (nominal 2 inch NPT) bung adaptor to fit standard fuel talk openings. The bung adaptor turned relative to the pump body, making it very easy to install in a fuel tank.

E lectrical Connection: Electrical connections were simple. The Mico 5012 battery cable was equipped with two clamps for connecting the pump to a battery. The pump could be operated on either positive or negative ground vehicle electrical systems. However, care must be taken to connect the black cable lead to the ungrounded battery terminal to avoid lower flowrates than normal. The installation instructions supplied with the pump recommended a 30 amp slow-blow fuse be installed adjacent to the ungrounded battery terminal, but no fuse was supplied.

Filling A Fuel Tank: The outlet hose was equipped with a standard lever operated fuel nozzle. It took about 71 N (16 lb) hand force to hold the nozzle lever. The unique design of the pump. with the impeller located at the bottom of the fuel supply tank, allowed for intermittent closing of the nozzle valve while the motor was running.

It took about 4 minutes to fill a 225 L (50 gal) tractor fuel tank with filler opening typically located 1 m (3.3 ft) higher than the top of a typical farm truck fuel supply tank. An optional fuel supply nozzle that could be locked open, equipped with an automatic shutoff when filled, would be beneficial for large tractors as it would free the operator to do other servicing while refueling. The pump had a 30 minute duty cycle. As a result, from I 590 to 1 800 L (350 to 396 gal) could be continuously pumped before the electric motor had to be allowed to cool.

Servicing: The Mico 5012 was equipped with a plastic screen located at the bottom of the impeller housing. The screen was easily cleaned since it was located on the outside of the impeller housing. The pump and motor required no lubrication.

SAFETY

The discharge nozzle, when not in use, had to be stored on top of the fuel supply tank or laid on the ground. This was inconvenient. It is recommended that the manufacturer supply a receptacle on the pump body to store the nozzle when not in use.

The nozzle could not be locked to the pump body. It is recommended that the manufacturer consider a means of locking the nozzle to the pump body to prevent theft.

To prevent possible ignition of fuel vapours from engine exhaust, it is advised when using the pump that the vehicle engine be stopped. Since the current draw of the pump was 27 amps at a battery voltage of 12 volts, there was no need to charge the battery while pumping. A fully charged battery would provide a Couple of hours of pumping before recharging was necessary.

OPERATOR'S MANUAL

The operator's manual contained clearly illustrated installation, operation, maintenance, and safety instructions. A comprehensive, well illustrated parts list was also provided.

MECHANICAL PROBLEMS

The Mico 5012 was operated for about 6 hours. The intent of the test was an evaluation of functional performance and an extended durability evaluation was not conducted.

Two problems occurred during the functional evaluation. The impeller housing was slightly larger than most 50 mm (nominal 2 in NPT) fuel supply tank openings (FIGURE 4), making it necessary to force the standpipe through the opening.

The outlet hose was very soft and kinked frequently (FIGURE

5), restricting fuel flow, when filling tanks. It is recommended that the manufacturer modify the fuel supply hose to prevent kinking.

FIGURE 4. Impeller Housing Too Large for 50 mm Fuel Supoly Tank Opening.

FIGURE 5. Kinked Outlet Hose.

APPENDIX I
SPECIFICATIONS

MAKE:	Mico 5012 Series
MODEL:	02-820-012
SERIAL NUMBER:	77017
DUTY CYCLE:	
-- normal operation	30 minutes
OVERALL DIMENSIONS:	
-- height	229 mm (9 in)
-- width	114 mm (4.3 in)
-- length	108 mm (4.25 in)
TOTAL WEIGHT:	10 kg (21 lb)
STANDPIPE:	
-- impeller housing (outside diameter)	56 mm (2.2 in)
-- size	25 mm (nominal 1 in pipe)
-- standard length	762 mm (30 in)
-- storage tank bung adaptor	50 mm (nominal 2 in NPT)
DISCHARGE HOSE:	
-- size	25 mm (1 in)
-- length (with nozzle)	3.9 m (12.8 ft)
MOTOR:	
-- power requirement	12 V DC
-- polarity	either positive or negative
-- battery cable length	3.7 m (12 ft)
-- battery connectors	clamps

APPENDIX II
METRIC UNITS

In keeping with the Canadian metric conversion program, this report has been prepared in SI units For comparative purposes, the following conversions may be used:

1 litre per minute (L/min)	= 0.22 Imperial gallons per minute (gal/min)
1 metre (m) = 1000 millimetres (mm)	= 39.37 inches (in)
1 Newton (N)	= 0.22 pounds force (lb)
1 kilogram {kg)	= 2.20 pounds mass (lb)

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